the projection system, the drive unit comprising a stationary part which is fastened to a first frame of the lithographic device, while the measuring system comprises a stationary part and a movable part which is fastened to the substrate table for cooperation with the stationary part of the measuring system, characterized in that the stationary part of the measuring system is fastened to a second frame of the lithographic device which is dynamically isolated from the first frame, and in that the projection system is fastened to the second frame.

REMARKS

Claims 1-8 are pending. By this amendment, claims 2, 6 and 8 are amended. In particular, claims 2, 6 and 8 are rewritten in independent form. The attached Appendix includes a marked-up copy of each rewritten claim (37 C.F.R. §1.121(c)(1)(ii)).

I. All Pending Claims are Patentable

Applicant notes with appreciation the indication that claims 2 and 8 contain allowable subject matter. Since claims 2 and 8 have been rewritten in independent form, these claims are allowable. Applicant respectfully submits that all pending claims are in condition for allowance for at least the reasons set forth below.

Claims 1 and 3-7 stand rejected under 35 U.S.C. §102(b) over U.S. Patent No. 4,891,526 to Reeds. This rejection is respectfully traversed.

Applicant respectfully submits that independent claims 1 and 4 (as well as their dependent claims 3 and 5) are patentable over Reeds for at least all of the reasons set forth in Applicant's previous response. These reasons also apply to claim 6 (as well as its dependent claim 7), which has been rewritten in independent form to include all of the features of claim 4. Claim 6 is further patentable over Reeds because of the additional features recited therein.

In addition to the features recited in claim 4, claim 6 further recites, *inter alia*, "a further drive unit for displacing the mask table relative to the projection system in a scanning direction perpendicular to the main axis, the further drive unit comprising a stationary part

which is fastened to the first frame." Thus, claim 6 recites (i) the respective drive units of the mask and substrate tables have stationary parts fastened to the first frame, and (ii) a second frame that is dynamically isolated from the first frame and to which the stationary part of the measuring system is fastened. Reeds does not disclose or suggest such a combination of features. The Office Action fails to address this aspect of claim 6 when it makes its rejection, but rather merely states "same as that of claim 1 but in a second direction." The Office Action has not addressed all features added in claim 6.

With respect to the "dynamically isolated" feature recited in all independent claims of this application, the Office Action asserts that the flexible mounts 26 of Reeds dynamically isolate platform 20 from base 28. Applicant respectfully submits that platform 20 is not dynamically isolated from base 28 of Reeds.

As described in the present specification, the reticle stage base support structure 80 and the bracket structures 114A-114D (which correspond to the "first frame" of claims 1 and 4) do not receive the weight of the reticle stage base structure 32 and of the supporting structure 94. See, for example, Figs. 2-4 and page 16, lines 13-15 and page 17, lines 22-26 of the present application. Similarly, the reaction frame 261 (which also corresponds to the "first frame" of claims 1 and 4) does not receive the weight of the substrate stage base 228. See, for example, Figs. 7-7C and page 6, line 26 - page 10, line 4. This is why the reaction force-receiving frame is dynamically isolated from the support (the claimed "second frame") of the stationary part of the measuring system. See, e.g., page 16, lines 13-15. For example, because the reaction force-receiving frame does not receive the weight of the stage base, movement of the reaction force-receiving frame does not induce undesirable movement of the stage base or the elements mounted to the stage base. See, e.g., page 3, lines 7-16 of this application.

Similarly, the machine frame 85 and column 87 of U.S. Patent No. 5,953,105 (from which the claims of this application have been copied, and which correspond to the claimed "first frame") do not receive the weight of the reference frame 89 (which supports the weight of the mask support member 101), and the arm 159 of U.S. Patent No. 5,953,105 does not receive the weight of the reference frame 89 (which supports the weight of the substrate support member 147). See, for example, Figs. 1, 4 and 5, col. 9, line 53 - col. 10, line 4 and col. 12, lines 43-52 of U.S. Patent No. 5,953,105.

On the other hand, the base 28 of Reeds receives the weight of the platform 20 through the flexible mounts 26a-26c. See, for example, Fig. 6 of Reeds, which shows that the lower surface of the center hub 126a rests directly on the cam 132a (which is attached to the base 28). Thus, platform 20 is not dynamically isolated from base 28. Rather, movements of the base 28 will induce undesired movement of the platform 20 because the platform 20 is supported by the base 28.

As described above, Reeds does not disclose or suggest an arrangement in which base 28 and platform 20 are dynamically isolated from each other. In Reeds, the stage is driven in the horizontal plane by gear motors 36 and 61 (see, for example, Fig. 3), which are fixed to the base 28 via the flange 38 (see Fig. 7). Due to the drive train formed between the motors and the stage by the X- and Y- drive bars 68 and 50, any forces (particularly forces having a horizontal component) applied to the base 28 to which the motors are mounted will be transferred to the stage via the drive train. The provision of flexible mounts 26 is irrelevant.

The drive trains between the motors 36/61 and the stage also would transmit vertical forces between the stage and the base 28. Moreover, and as explained previously (and as reiterated below), the flexible mounts 26 do not prevent the transmission of vertical forces between the base and the stage because the upper portion of center hub 126a is fixedly

attached to stator 24, while the lower surface of center hub 126a rests directly on cam 132a (see Fig. 6).

Accordingly, Reeds does not disclose or suggest the claimed dynamically isolated first and second frames.

Reeds discloses an X-Y-θ-Z positioning stage in which the structure for moving a wafer in the X and Y directions is mounted on the structure for rotating in the θ direction. The entire X-Y-θ stage system also can be moved vertically in the Z direction or tilted with respect to the X-Y plane by controlling one or more of three actuators that are respectively coupled to three flexible mounts 26a-26c.

The basic structure is illustrated in Fig. 1 and described at, for example, col. 4, lines 21-48 of Reeds. An X-Y stage plate 12 is mounted on X translation linear bearings 14a, 14b. Those bearings, in turn are mounted on an intermediate plate 16, which rides on Y translation linear bearings 18a, 18b. Each of the bearings 14a, 14b, 18a, 18b consists of a line of balls positioned between two V-shaped notches in which the ball surfaces roll. The Y-translation bearings are, in turn, mounted on a θ rotation stage platform 20, upon which an interferometer 34 also is mounted. Platform 20 is mounted on the end of a rotor drum 21, which is set inside rotation bearings 22, which in turn are set inside of a stator 24. Bearings 22 also consist of ball bearings mounted in channels.

As indicated in col. 4, lines 42-45, stator 24 is secured to a base 28 by three vertically adjustable flexible mounts 26a, 26b, 26c. As described at col. 8, line 58 - col. 9, line 15, each flexible mount 26a-26c has the structure illustrated in Fig. 6, including a flexible circular metal diaphragm 124a having a center hub 126a drilled and tapped to receive a mounting screw 128a, which attaches the flexible mount to stator 24. As shown in Fig. 6, the lower portion of the center hub 126a rests upon a cam 132a, which is rotated by a motor 136a in order to adjust the height of the mount 26a. See, for example, col. 8, line 67 - col. 9, line 2.

The mounts 26 are very stiff (see, for example, col. 9, lines 4-8, which states that they undergo a deflection of 0.010 inches for an applied force of 500 pounds; presumably there would be an even smaller deflection for a force applied in the horizontal direction since the mounts are thicker in the horizontal direction). The height and tilt of the stage apparatus can be controlled by controlling the motors 136a-136c associated with the respective mounts 26a-26c. See col. 9, lines 11-15.

Additionally, as illustrated in Fig. 7, the motors for causing movement in the X, Y and θ directions are mounted to respective flanges 38, which in turn are mounted to base 28.

Flexible mounts 26a-26c do not dynamically isolate platform 20 from base 28. The flexible mounts 26a-26c are well known metal diaphragms that are designed to be stiff in the horizontal direction (in Fig. 6) while allowing for movement in the vertical direction. That is, the mounts allow the central hub 126 to move vertically with respect to the outer annular portion of the mounts (the annular portion is attached to the base 28 by screws 130a and 131a in Fig. 6), while preventing the central hub 126 from moving horizontally with respect to the outer annular portion of the mounts. The purpose of the mounts is to allow the stator 24 (and platform 20 mounted on the stator as shown in Fig. 6) to move vertically relative to motor 136 (and the base 28 to which the motor is mounted) without allowing for horizontal movement between those elements. See, for example, col. 2, lines 45-46 and col. 9, lines 16-21, where Reeds states "the center of rotation for the rotating stage does not move relative to the beam axis." This confirms that no lateral displacement is permitted between the base 28 and the platform 20. Since these elements move together, they cannot be dynamically isolated from each other.

Thus, any horizontal forces (including horizontal reaction forces) applied to the base 28 will be transmitted to the platform 20 through the mounts 26. In addition, because the upper portion of center hub 126a is fixedly attached to stator 24, while the lower surface of

center hub 126a rests directly on cam 132a (see Fig. 6), any vertical forces (vertical with reference to Fig. 6) applied to base 28 (to which the motor 136a that drives cam 132a is mounted) will be directly transmitted through center hub 126a to stator 24. Accordingly, mounts 26 do not dynamically isolate base 28 from platform 20.

The fact that mounts 26a-26c do not dynamically isolate platform 20 from base 28 is further confirmed by col. 9, lines 21-26, where Reeds states:

> It should be noted also that the support points for the vertically adjustable flexible mounts are located as nearly as possible in the planes of the X and Y drives, in order that reaction forces resulting from X and Y accelerations will have minimal impact on Z.

Thus, Reeds expressly acknowledges that reaction forces are transmitted throughout the system.

II. The Interference Should be Declared

Applicant repeats the request that an interference be immediately declared between the present application and U.S. Patent No. 5,953,105 to Van Engelen et al. Even if the Examiner continues to reject some of the claims, the interference should be declared because at least some claims have been allowed. See, e.g., 37 C.F.R. §1.606 and MPEP §2306. The Examiner is requested to suspend *ex parte* prosecution of the present application, either pursuant to 37 C.F.R. §1.103(e), so that the application can be reviewed by the Examiner for declaration of an interference, or pursuant to 37 C.F.R. §1.615(a) upon immediate declaration of an interference.

The following three counts (numbered I, II and III) are proposed:

Count I (claim 1 of this application - claim 1 of Van Engelen et al.)

A positioning device comprising an object table, a sub-system for processing an object to be placed on the object table, a drive unit for displacing the object table relative to the sub-system, and a measuring system for measuring a position of the object table relative to the sub-system, the drive unit comprising a stationary part which is fastened to a first

frame of the positioning device, while the measuring system comprises a stationary part and a movable part which is fastened to the object table for cooperation with the stationary part of the measuring system, characterized in that the stationary part of the measuring system is fastened to a second frame of the positioning device which is dynamically isolated from the first frame.

Applicant submits that claims 1 and 3-5 of this application correspond to Count I. Applicant submits that claims 1 and 3-7 of Van Engelen et al. correspond to Count I. Claims 1 and 3-5 are patentable for at least the reasons set forth above in section I. In addition, Count I corresponds to patent claim 1 of Van Engelen et al., which is presumed to be valid. All requirements of 37 C.F.R. §1.607 have been met by this request and by Applicant's previous submissions, namely the November 26, 1999 Preliminary Amendment and the August 30, 2000 Amendment.

Count II (claim 2 of this application - claim 2 of Van Engelen et al.)

A positioning device comprising an object table, a sub-system for processing an object to be placed on the object table, a drive unit for displacing the object table relative to the sub-system, and a measuring system for measuring a position of the object table relative to the sub-system, the drive unit comprising a stationary part which is fastened to a first frame of the positioning device, while the measuring system comprises a stationary part and a movable part which is fastened to the object table for cooperation with the stationary part of the measuring system, characterized in that the stationary part of the measuring system is fastened to a second frame of the positioning device which is dynamically isolated from the first frame, and in that the sub-system is fastened to the second frame.

Applicant submits that claims 2 and 8 of this application correspond to Count II. Applicant submits that claims 2 and 11 of Van Engelen et al. correspond to Count II. These claims define an invention that is separately patentable from the invention of Count I as recognized by the Examiner in indicating that application claims 2 and 8 contain patentable

subject matter. All requirements of 37 C.F.R. §1.607 have been met by this request and by Applicant's previous submissions, namely the November 26, 1999 Preliminary Amendment and the August 30, 2000 Amendment.

Count III (claim 6 of this application - claim 8 of Van Engelen et al.)

A lithographic device comprising a radiation source, a mask table, a projection system having a main axis, a substrate table, a drive unit for displacing the substrate table relative to the projection system in at least one direction perpendicular to the main axis, and a measuring system for measuring a position of the substrate table relative to the projection system, the drive unit comprising a stationary part which is fastened to a first frame of the lithographic device, while the measuring system comprises a stationary part and a movable part which is fastened to the substrate table for cooperation with the stationary part of the measuring system, characterized in that the stationary part of the measuring system is fastened to a second frame of the lithographic device which is dynamically isolated from the first frame, and in that the lithographic device comprises a further drive unit for displacing the mask table relative to the projection system in a scanning direction perpendicular to the main axis, the further drive unit comprising a stationary part which is fastened to the first frame, while the substrate table is displaceable relative to the projection system parallel to at least the scanning direction, the measuring system comprising a further stationary part which is fastened to the second frame and a further movable part which is fastened to the mask table for cooperation with the further stationary part of the measuring system for measuring a position of the mask table relative to the projection system or for measuring a position of the mask table relative to the substrate table.

Applicant submits that claims 6 and 7 of this application correspond to Count III. Applicant submits that claims 8-10 of Van Engelen et al. correspond to Count III. These claims define an invention that is separately patentable from the inventions of Counts I and II for the reasons set forth above in section I. All requirements of 37 C.F.R. §1.607 have been met by this request and by Applicant's previous submissions, namely the November 26, 1999 Preliminary Amendment and the August 30, 2000 Amendment.

III. Conclusion

In view of the foregoing, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are earnestly solicited.

Should the Examiner believe anything further would be desirable to place this application in even better condition for allowance, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number listed below.

Respectfully submitted,

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JAO:MAC/ms

Attachments:
Appendix
Petition for Extension of Time

Date: November 19, 2001

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461

APPENDIX

Changes to Claims:

The following are marked-up versions of the amended claims:

2. (Amended) A positioning device ~~as claimed in claim 1~~ comprising an object table, a sub-system for processing an object to be placed on the object table, a drive unit for displacing the object table relative to the sub-system, and a measuring system for measuring a position of the object table relative to the sub-system, the drive unit comprising a stationary part which is fastened to a first frame of the positioning device, while the measuring system comprises a stationary part and a movable part which is fastened to the object table for cooperation with the stationary part of the measuring system, characterized in that the stationary part of the measuring system is fastened to a second frame of the positioning device which is dynamically isolated from the first frame, ~~characterized~~ and in that the sub-system~~,~~ is fastened to the second frame.

6. (Amended) A lithographic device ~~as claimed in claim 4~~ comprising a radiation source, a mask table, a projection system having a main axis, a substrate table, a drive unit for displacing the substrate table relative to the projection system in at least one direction perpendicular to the main axis, and a measuring system for measuring a position of the substrate table relative to the projection system, the drive unit comprising a stationary part which is fastened to a first frame of the lithographic device, while the measuring system comprises a stationary part and a movable part which is fastened to the substrate table for cooperation with the stationary part of the measuring system, characterized in that the stationary part of the measuring system is fastened to a second frame of the lithographic device which is dynamically isolated from the first frame, ~~characterized~~ and in that the lithographic device comprises a further drive unit for displacing the mask table relative to the projection system in a scanning direction perpendicular to the main axis, the further drive unit

comprising a stationary part which is fastened to the first frame, while the substrate table is displaceable relative to the projection system parallel to at least the scanning direction, the measuring system comprising a further stationary part which is fastened to the second frame and a further movable part which is fastened to the mask table for cooperation with the further stationary part of the measuring system for measuring a position of the mask table relative to the projection system or for measuring a position of the mask table relative to the substrate table.

8. (Amended) A lithographic device ~~as claimed in claim 4~~ comprising a radiation source, a mask table, a projection system having a main axis, a substrate table, a drive unit for displacing the substrate table relative to the projection system in at least one direction perpendicular to the main axis, and a measuring system for measuring a position of the substrate table relative to the projection system, the drive unit comprising a stationary part which is fastened to a first frame of the lithographic device, while the measuring system comprises a stationary part and a movable part which is fastened to the substrate table for cooperation with the stationary part of the measuring system, characterized in that the stationary part of the measuring system is fastened to a second frame of the lithographic device which is dynamically isolated from the first frame, ~~characterized~~ and in that the projection system is fastened to the second frame.